WE CLAIM:

1. Hybrid radio frequency electronic circuit apparatus comprising the combination of:

an electrically insulating substrate member having radio frequency electrical circuit trace patterns received on a topside surface thereof, a continuous ground plane member received on a bottom side surface thereof and selectively located substrate apertures traversing a substrate thickness portion intermediate said topside surface circuit trace patterns and said bottom side surface ground plane member;

a plurality of electronic circuit components mounted on said topside surface of said electrically insulating substrate member in selected electrical connection with said topside surface electrical circuit trace patterns and said bottom side surface ground plane member; and

a thermally conductive metallic substrate carrier member extending substantially parallel with said electrically insulating substrate member and having a recessed area containing and supporting said rigid electrically insulating substrate member therein;

said metallic substrate carrier member including a plurality of upstanding thermally conductive metallic substrate-supporting pillar members received in said recessed area and disposed in precise computerized milling machine-determined lateral registration with said selectively located substrate apertures;

said upstanding metallic pillar members each including a portion extending through said substrate thickness portion at a substrate aperture and into electrical connection with said substrate bottom side surface continuous ground plane member and selected of said substrate topside surface electrical circuit trace patterns.

2. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein said topside surface radio frequency electrical circuit trace patterns include one of microwave radio frequency energy transmission line members and electrical reactance members.

3. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein said selectively located substrate apertures comprise one of electrically conductive aperture wall surface area and electrically non conductive aperture wall surface area apertures.

4. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein:

said metallic substrate carrier member also includes an upstanding thermally conductive metallic pedestal member received in said recessed area and disposed in precise computerized milling machine-determined lateral registration with a mating substrate aperture; and

said hybrid radio frequency electronic circuit apparatus includes a semiconductor die embodied electronic component received on an upper surface portion of said metallic pedestal member within said mating substrate aperture.

5. The hybrid radio frequency electronic circuit apparatus of claim 1 further including electrical bond wires connected with electrical circuit nodes of said substrate.

6. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein said plurality of electronic circuit components mounted on said topside surface of said electrically insulating substrate member in selected electrical connection with said topside surface electrical circuit trace patterns and said bottom side surface ground plane member include electrical capacitor members disposed on selected of said pillar members and electrically connected with electrical circuit nodes of said substrate member.

7. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein said upstanding metallic pillar member portions extending through said substrate thickness portion into electrical connection include one of solder, electrically conductive epoxy adhesive and indium material interconnection media with one of said substrate bottom side surface continuous ground plane member and said substrate topside surface electrical circuit trace patterns.

8. The hybrid radio frequency electronic circuit apparatus of claim 1 wherein said thermally conductive metallic substrate carrier member is comprised of brass metal and wherein said electrically insulating substrate member includes additional of said substrate apertures traversing a substrate thickness portion that are out of registration with a upstanding thermally conductive metallic substrate-supporting pillar member.

9. The low electrical impedance and thermally efficient method of mounting a substrate-received hybrid electronic circuit in a supporting metallic carrier member, said method comprising the steps of:

disposing a plurality of thickness-traversing apertures in precisely defined, circuit trace and ground plane conductor-inclusive, lateral locations of said substrate-received hybrid electronic circuit;

forming a substrate-receiving recess in said supporting metallic carrier member;

said forming step including leaving a plurality of upstanding carrier metal-comprised pillar members disposed in selected precise lateral locations across a floor portion of said metallic carrier member substrate-receiving recess;

each said upstanding carrier metal-comprised pillar member being disposed in a recess location laterally registered with one of said substrate thickness-traversing apertures;

each said upstanding carrier metal-comprised pillar member including a portion entering one of said substrate thickness-traversing apertures and extending through said ground plane conductor elements and said substrate circuit trace in an assembled hybrid electronic circuit condition; and

joining each said upstanding carrier metal-comprised pillar member with surrounding portions of said substrate circuit trace and said ground plane conductor elements using a thermally responsive conductive media.

10. The low electrical impedance and thermally efficient method of mounting a substrate-received hybrid electronic circuit in a supporting metallic carrier member of claim 9 wherein

said forming step includes cutting said substrate-receiving recess in said supporting metallic carrier member using a computer algorithm guided milling machine cutter bit.

11. The low electrical impedance and thermally efficient method of mounting a substrate-received hybrid electronic circuit in a supporting metallic carrier member of claim 9 wherein:

said step of disposing a plurality of thickness-traversing apertures in precisely defined, lateral locations of said substrate-received hybrid electronic circuit also includes disposing a shaped additional larger aperture in a precisely defined, lateral location of said substrate-received hybrid electronic circuit; and

said forming step also includes leaving an upstanding carrier metal-comprised pedestal member, disposed in registration with said shaped additional larger substrate aperture, on a floor portion of said metallic carrier member substrate-receiving recess; and further including the step of

locating an electronic circuit die member on an upper surface of said upstanding carrier metal-comprised pedestal member within said substrate shaped additional larger aperture.

12. The low electrical impedance and thermally efficient method of mounting a substrate-received hybrid electronic circuit in a supporting metallic carrier member of claim 11 further including the step of connecting circuit nodes of said pedestal-mounted electronic circuit die member with circuit nodes of said substrate-received hybrid electronic circuit using bond wire jumper conductors.

13. The low electrical impedance and thermally efficient method of mounting a substrate-received hybrid electronic circuit in a supporting metallic carrier member of claim 9 wherein said step of joining each said upstanding carrier metal-comprised pillar member with surrounding portions of said substrate circuit trace and said ground plane conductor elements using a thermally responsive conductive media includes use of one of the materials of a conductive epoxy adhesive, indium solder and tin-lead solder.

14. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member, said method comprising the steps of:

segregating a selected length of metallic carrier member stock from an extended length of said stock;

defining in computer code an array of milling machine cutter paths extending across an upper surface of said selected length of metallic carrier member stock, from an open end of a carrier recess well to be milled in said metallic carrier member upper surface;

said defined milling machine cutter paths including a plurality of milling machine cutter operation-free upstanding metallic carrier member pillar regions selectively disposed across a bottom surface of said recess well in response to pillar region-defining coding in said computer code;

machining said recess well, with recess well remainder areas comprising said upstanding pillar regions, into said metallic carrier member stock using lateral movements of said milling machine cutter controlled by said computer code;

fabricating a carrier recess well-conforming, conductor-clad, electrically insulating, hybrid electrical circuit device substrate member from a blank of said substrate member stock using a milling machine also controlled by said computer code;

said fabricated hybrid electrical circuit device substrate member including substrate-piercing hole members disposed therein in clad conductor locations registered with said metallic carrier member pillar regions; and

attaching said hybrid electrical circuit device substrate member to said metallic carrier member within said carrier recess well using heat responsive electrically conductive attachment material;

said attaching step including forming attachment material bonds between said clad conductor and said upstanding metallic carrier member pillar regions at said substrate-piercing hole members.

15. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member of claim 14 wherein said step of machining said recess well includes milling machine cutter lateral cutting engagement with said metallic carrier member stock.

16. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member of claim 14 wherein said milling machine cutter control computer code includes a special case algorithm supporting cutter machining in pillar separation spaces smaller than a nominal cutter diameter.

17. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member of claim 14 wherein said step of fabricating a carrier recess well-conforming, conductor-clad, electrically insulating, hybrid electrical circuit device substrate member from a blank of said substrate member stock includes milling machine cutter operation on a substrate member upper surface conductor comprising a microwave electronic circuit and milling machine cutter operation through a lower ground plane conductor.

18. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member of claim 14 wherein said fabricated hybrid electrical circuit device substrate member further includes additional substrate-piercing hole members disposed in clad conductor locations non registered with said metallic carrier member pillar regions.

19. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic

carrier member of claim 14 wherein said step of defining in computer code an array of milling machine cutter paths extending across an upper surface of said selected length of metallic carrier member stock, from an open end of a carrier recess well to be milled in said metallic carrier member upper surface includes defining a sequence of orthogonally disposed milling machine cutter movement paths.

20. The computer aided, low grounding impedance and efficient-cooling method of disposing a substrate-received hybrid electronic circuit device on a device-supporting metallic carrier member of claim 14 wherein said step of defining in computer code an array of milling machine cutter paths extending across an upper surface of said selected length of metallic carrier member stock, from an open end of a carrier recess well to be milled in said metallic carrier member upper surface, includes defining in computer code a pedestal member region larger in physical size than said carrier member pillar regions.